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THE CASSITERIDES, AND THE ANCIENT TRADE IN TIN.

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Which were the islands called the Cassiterides, or tin islands? This question has provoked a lively disputation among modern students of history. If, it is fair to remark, they had been students of geography also, they might have avoided sundry disagreements that have arisen from lack of the precaution to examine a map of the parts of the world in controversy.

Herodotus, writing in the 5th century B.C., makes the first mention of the Cassiterides. He had been speaking of the river Eridanus, in the Baltic region, whence came the amber, and he confesses himself ignorant concerning those distant lands; he proceeds:

" I know as little about the Kassiterides, from which we are said to get our tin (*κασσίτερος*). . . . . It is nevertheless certain that both our tin and our amber are brought from these extreme parts."

Pliny in his " Naturalis Historia " (A.D. 77) states that the first to fetch tin from the Cassiterid island was Midacritus. He uses the word *plumbum*, or lead, in this statement, for the Romans had no separate word for tin at that time. Pliny calls tin *plumbum candidum*, or white lead, to distinguish it from lead itself, which he calls *plumbum nigrum*. Elsewhere he says that the white variety is more valuable than the black; it was called by the Greeks *cassiteros*, he remarks, so it is obvious that he knew the derivation of the word Cassiterid, and must have meant tin when he used *plumbum* by itself in this context. The

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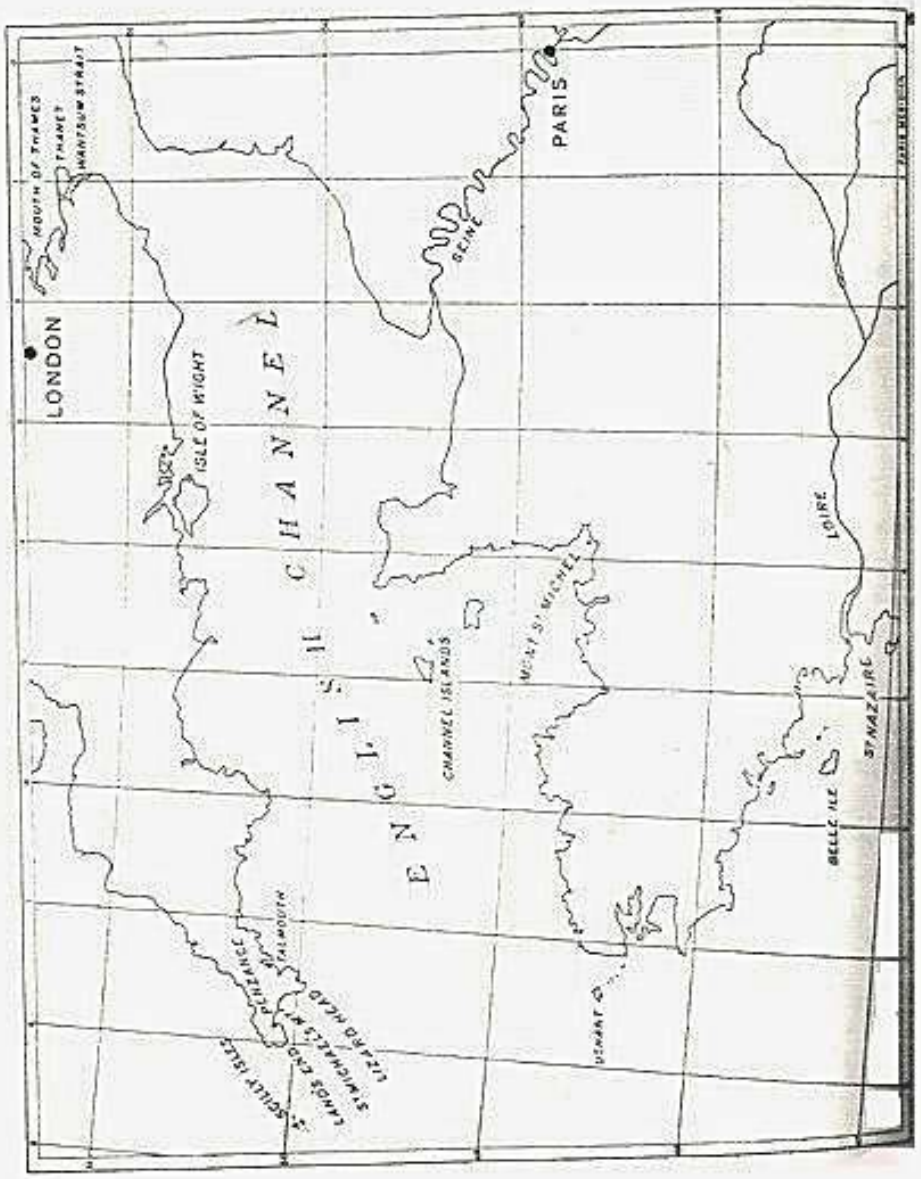

map of the English Channel, southern England and north-western France.

name Midacritus has been supposed by some writers to be a variant of Melcarth, the Phoenician Hercules, therefore the Tyrians have been accorded the priority in the tin trade of the Atlantic; but, according to the text of Hyginus, who antedated Pliny by 50 years, the name should read Midas Phryx, or the Phrygian. Elsewhere Pliny mentions "Midas, the Phrygian." Thus, perhaps, the first to bring tin from the Cassiterides were the Phrygians, as personified by their mythical king, Midas, who, according to Hellanicus, flourished in about 970 B.C. The maritime supremacy of the Phrygians lasted from 903 to 824 B.C., when it passed to the Phoenicians. On the other hand, it is still possible that Midacritus is the true reading of the name, because, as Cary suggests,* it is more likely that Hyginus improved Midacritus to Midas than that Pliny disguised Midas as Midacritus. This name is Greek in structure. And since Midacritus won fame by his voyage, it is reasonable to suppose that he went beyond Tartessus, into the Atlantic, and to the islands lying northward, off the coast of either Gaul or Britain, to fetch his tin. This he did probably earlier than 500 B.C. Moreover, as the Carthaginians closed the Strait of Gibraltar to the Greeks at the close of the 6th century B.C., and for two centuries afterward, it is possible that Midacritus made his voyage for the benefit of the Carthaginians, not for the Greeks.

Velleius Paterculus states that the Phoenicians founded Gades, or Cadiz, in south-western Spain, at the time when they settled at Utica, on the coast of northern Africa, in what is now Tunis. Utica is said to have been founded 287 years before Carthage, which dates from 853 B.C.; therefore Gades was established in about 1100 B.C. To the Phoenicians it was known as Gadir (a stronghold), to the Greeks as Gadeira, and to the Romans as Gades. It was

* "The Greeks and Ancient Tin Trade with the Atlantic," by M. Cary; Journal of Hellenic Studies, Vol. XLIV, part II, p. 166; 1924.

from this port that the Phoenicians sailed northward to the tin islands.

We are told by Pliny that Himilco, a Phoenician, made a voyage "to explore the outer parts of Europe" at the time his people at Carthage sent Hanno to establish a market on the west coast of Africa, in about 500 B.C. Himilco sailed into the English Channel, and first indicated the position of Britain and Ireland. It has been suggested that it was he who started the trade in tin.

Massilia, or Marseilles, at the mouth of the Rhone, was founded by the Phocaeans in 598 B.C. and became a centre of Greek commerce. It is not surprising, therefore, that the next voyager of whom we have knowledge was a Greek, a mathematician named Pytheas, who, in about 325 B.C., was sent by the merchants of Massilia to the amber coast. For centuries this queer product had been obtained from the Baltic region; its magnetic qualities had puzzled the ancients, who used it for making amulets. An account of the travels of Pytheas is believed to have been published soon after the death of Aristotle, in 322 B.C., but only fragments of it have survived in the writings of the later Greek historians. From such quotations we learn that he sailed around Spain to Brittany, and thence to the Kentish coast of Britain, whence he proceeded to the Baltic, going as far as the mouth of the Vistula. On his return he re-visited the British Islands, but he does not mention the tin mines, although it is supposed that the interest in this trade on the part of the Greek colony at Massilia was one of the motives prompting his voyage.

Next we come to Posidonius, a Syrian Stoic, who wrote in about 90 B.C. He was a geographer, and had been a student with Cicero at Rhodes. Posidonius sailed into the Atlantic, and visited Belerion, as he called the district from which the tin was obtained.* According to Strabo,

* He also visited Iberia and sojourned at Gades.

he stated that tin was produced in the Cassiterides and in the Britannic Islands. Both Strabo (writing in A.D. 18) and Diodorus (20 B.C.) use the information given by Posidonius. Diodorus Siculus says:*

"The inhabitants of Britain who live on the promontory named Belerion [Cornwall] are remarkably hospitable, and because of their intercourse with merchants they are civilized in their ways. It is they who procure tin, working with great skill the earth that produces it. The ground is rocky, with earthy veins in which they make a passage, and after the tin is fused, they clean it, and shape it into knuckle-bones. Then they take it to an island lying off the coast of Britain named Ictis, for at low tide the ground between is left dry, so that with carts they carry the tin in quantity to the island. The merchants buy it from the natives and carry it thence into Gaul, and finally on foot through Gaul they bring the loads on horseback in about thirty days to the mouth of the river Rhone.

"Tin is found in many parts of Iberia [Spain], not being discovered on the surface as some have babbled in their histories, but being dug and smelted just like silver and gold. For beyond the land of the Lusitanians are many mines of tin, in the islands that lie off Iberia in the ocean, which on this account are called the Cassiterides. And a great deal is brought from the British island also to that part of Gaul that lies opposite; and across the midlands of the Celtic country it is brought on horseback to the people of Massilia [Marseilles] and to the town called Narbona [Narbonne]. This is a colony of Romans which because of its handiness and its wealth is the greatest place of exchange in those regions."

Narbonne (the Roman "Narbo") is on the coast of southern France, about a hundred miles west of Marseilles. Diodorus, in referring to Narbo as a Roman colony, is

* Book V, chap 2.

confusing the present with the past; for, although Narbo was Roman in his day it was founded by the Greeks in 120 B.C., and its trade was still in Greek hands when Posidonius wrote the account from which Diodorus is quoting.* Gaul was known as Galatia to the Greeks and as Celtica to the Romans before they penetrated into that part of Europe. The Greek word used by Diodorus for the ingots of tin is *αστράγαλος*, or knuckle-bone, this being the shape in which the metal was cast. In 1823 one of these ingots was found when Falmouth harbour was being dredged. It weighs 159½ pounds,† and is 2½ feet long. In one corner of the ingot a miniature representation of itself, or trade-mark, is stamped on the tin; it is slightly convex on one side, as if intended to fit the bottom of a boat; and the whole of it is so shaped that it could be slung easily on a horse. Two such ingots would make a fair load for transport across Gaul.

Strabo says:‡

"The Cassiterides are ten in number, and lie near each other in the ocean toward the north from the haven of the Artabri [in Gallicia]. One of them is desert, but the others are inhabited by men in black cloaks, clad in tunics reaching to the feet, girt about the breast, and walking with staves, thus resembling the Furies we see in tragic representations. They subsist by their cattle, leading, for the most part, a wandering life. Of the metals they have tin and lead, which with skins they barter with the merchants for earthenware, salt, and bronze trinkets. Formerly the Phoenicians alone carried on this traffic from Gades [Cadiz], concealing the passage from everyone, and when the Romans followed a certain ship-master, that they also might find the market, the ship-master of jealousy pur-

* T. Rice Holmes, in a "Ancient Britain," p. 499, argues that Diodorus obtained his information from Pytheas, through Timaeus.

† It has been re-weighed recently. A piece has been cut away for analysis, so the original weight was about 160 pounds.

‡ Book III, chap v.

posely ran his vessel upon a shoal, leading on those who followed him into the same destructive disaster; he himself escaped by means of a fragment of his ship, and received back at the public expense the value of the cargo he had lost.* The Romans nevertheless by frequent efforts discovered the passage, and as soon as Publius Crassus passing over to them perceived that the metals were dug out at a little depth and that the men were peaceably disposed, he declared it to those who already wished to traffic in this sea for profit, although the passage was longer than that to Britain."

Thus both in the first and in the last sentence of his description, the Greek geographer states that the source of the tin was not Britain itself, but a group of islands farther out to sea, that is, westward. The men resembling Furies may have been the Druids. Elsewhere Strabo says:

"Northward and opposite to the Artabri are the islands named Cassiterides, situated in the high seas, but under nearly the same latitude as Britain."

That describes the position, due north of Gallicia and west of Britain itself, of the Scilly Isles, which, mainly in consequence of this description, have been assumed by many writers to have been the source of the ancient supply of tin. Not enough note has been taken of Strabo's remark that the Phoenicians tried to mislead their contemporaries as to the whereabouts of the tin mines.

The Crassus mentioned by Strabo is generally believed to have been Publius Licinius Crassus, the younger son of the Triumvir; he subjugated the Aquitani in 57 B.C., and was killed in battle in Syria at the end of 54 B.C. Julius Caesar is supposed to have sent him to report on the tin-producing districts of the British Islands in 56 B.C., when Crassus was in Brittany and Caesar was preparing to invade Britain. On the other hand, if the passage in which Crassus

* This means that the merchants of Gades recompensed him.

is mentioned by Strabo be taken from Posidonius, as is more than probable, then the Publius Crassus must be, not the deputy of Julius Caesar, but the Crassus of the same name who was Consul in Spain in 97 B.C. Nothing is known concerning the investigation he made, and Pliny does not appear to have heard of it, for he fails to mention Britain itself as a source of tin, although he speaks of both Lusitania [Portugal] and Gallaecia [Gallicia] in that connection. Caesar himself seems to have had only a vague notion concerning the provenance of the British tin, for, in his "Gallic War," he says:

"They [the Britons] use bronze and gold money, and iron rings of fixed weight. The provinces remote from the sea produce tin, and those upon the coast [of Sussex, presumably, where he landed] iron; but the latter in no great quantity. Their bronze is all imported."

Caesar uses *plumbum album* for tin; the statement that it was produced *in mediterraneis regionibus* indicates the midlands, or, at least, far inland. From this it would appear that neither Crassus nor any other Roman official had visited the mines himself, but had contented himself with going to the places on the coast to which the tin was brought for sale. There he was told, probably, that the metal was produced in the interior, as was, in a sense, true; and from this he had inferred that the mines were far from tide-water.

A few more classical references to the tin islands must be quoted. Pomponius Mela (A.D. 42), a native of Spain, after speaking of Baetica [Andalusia] and Lusitania [Portugal], states that the group of islands named the Cassiterides, where tin is abundant, are situated *in Celticis*; he uses the word *plumbum*, but evidently he means tin. Pliny, a little later than Mela, says that "over against," or opposite, "Celtiberia is a group of islands that the Greeks called the Cassiterides on account of their abounding in tin." In another passage he says that tin, *plumbum*

candidum, has been fabulously reported to have been obtained from islands in the Atlantic. Tin did not become known to the Romans as *stannum* until the fourth century of our era. It is interesting here to note that Pliny uses the word *stannum* to designate an alloy of silver and lead, known to the metallurgists of our day as "work-lead," the first product from the smelting of a silver-bearing lead ore. On the next page he uses "stannum" for a compound metal, or alloy, of the pewter type, it being used, he says, for coating copper vessels. Throughout he uses "white lead," *plumbum candidum*, to designate tin. *Stannum* is derived from a Celtic word that survives in the old Cornish mining term "costean," to dig a prospecting trench, from *cothas*, to find, and *stean*, tin. So says that worthy writer, William Pryce, in his "Mineralogia Cornubiensis."

Ptolemy, in the second century A.D., says that the Cassiterides are ten in number and are situated in the western ocean, off the coast of Spain, and near the Nervian promontory, that is, Cape Finisterre.

On the Gallic side of the English Channel, in what is now Brittany, the tin trade was in the hands of the Veneti at the time, just before the Christian era, when Caesar was about to invade Britain. It is probable that the Greeks, and the Phoenicians before them, had dealings with the Veneti when they extended their commerce into north-western Gaul, to the mouth of the Loire. The region north of that river has been the scene of tin-mining in a remote past, and also in our own days. The islands off the mouth of the Loire have been identified with the Oestrymnides, which are mentioned by a Latin poet, Festus Avienus, who wrote in A.D. 370. A Belgian writer, Louis Siret, has made a valiant effort* to identify the Oestrymnides with the Cassiterides, on the basis of the description given by Avienus. He states that the people of Tartessus [or Tarshish, in south-western Spain] used to resort for trade

* "L'Anthropologie," 1908, p. 129.

to the Oestrymnides, and that the Carthaginians also used to sail "these seas." In his poem, "Orae Maritimae," Avienus states that the Phoenician navigator Himilco went round the sacred promontory [Cape St. Vincent] and then sailed along the coast of Lusitania [Portugal] until he reached the harbour of the Artabri [the Bay of Corunna], where a chain of lofty mountains, named Oestrymnis [the Cantabrian mountains], rises abruptly from the shore; thence he crossed the Oestrymnic gulf [the bay of Biscay] and arrived at the Oestrymnides, a group of islands "scattered widely about, and rich in tin and lead." He uses the words "*metallo divites stanni atque plumbi.*" Here we have the first use of *stannum* for tin. Avienus says that "these islands are inhabited by a numerous, proud, and industrious people, accustomed to commerce, and in the habit of going to sea in poor leathern boats." This suggests the coracles of the ancient Britons, who made their boats out of osiers covered with hides. Avienus proceeds to say that Himilco sailed two days farther to the grass-green sacred island [the emerald isle, Ireland], which is inhabited by the Hibernians, and is near the island of the Albiones [Britain]. The return voyage from the Oestrymnides is described as follows: "He who dares to steer from them into the open sea with a north wind, lands on the grassy shore of the Ligures," which may be reasonably supposed to indicate the country at the mouth of the Liger, or Loire, from which, as we shall see, intercourse was maintained in ancient days between Cornwall and Marseilles.

This description by Avienus is confused; he is a careless writer, and it is probable that he obtained his information at second hand, for the Oestrymnides* are not mentioned by any other author.† Such as it is, his description points to

* The Oestrymnides were known to the later Latin geographers as the Insulae Veneticæ, or Venetan Islands.

† Rhys Carpenter, in "The Greeks in Spain," traces the story of Avienus to a Massiliote sailing-book of about 530 B.C.

Cornwall rather than to the Loire country; for he says that it was two days sail from the tin region to Ireland and that the return journey southward into the open sea brought the traders to the mouth of the Loire. Evidently therefore the tin did not come from the islands at the mouth of that river.

It is probable that the tin deposits of Brittany were exploited before the trade with Cornwall was developed, for tin has been mined at an early period in the department of Morbihan, in the valley of the Loire, as is proved by ancient workings. In the estuary of the Villaine are alluvial deposits that contain tin at the rate of 15 to 20 pounds per cubic yard. If the veins are poor, that, insists Siret, is no proof that the detrital deposits derived from them were not rich.* To this argument no exception can be taken, except that every district in which the veins contain only traces of tin cannot be assumed to have had a rich alluvium in days gone by. At best his argument is of a negative character. He suggests that the geologic evidence of the submergence of the coast of Brittany indicates that the islands were larger formerly and that their extensive alluvial deposits have been either eroded or covered by the action of the sea. All of this, however, is unconvincing as proof that Belle Ile, Houat, and Haedik, the islands off the mouth of the Loire and near the coast of Morbihan, were the Cassiterides in face of the description of the voyage as given by Avienus himself and the information on the subject to be found in the writings of others, already quoted.

It is evident that the Phoenicians, and probably the Greeks also, endeavoured to keep to themselves the knowledge of their trade-route to the tin region. The ancients, and more especially the Phoenicians, made a practice of preserving their monopoly of a trade by keeping secret their

* Active operations were conducted by a French company at the mines of La Villeder, near Ploërmel, from 1880 to 1883. Stone and bronze celts were found in the ancient workings, says De Cessac. The tin occurs in a network of small veins that cease to be productive at a shallow depth—20 to 30 metres.

way of access. Thus the idea that the merchants of Tyre and Carthage obtained their tin from islands off the Spanish coast was allowed to gain currency, and modern writers have not failed to put forward this claimant to the industrial honour of the Cassiterides. Since these, according to Strabo, were farther from the continent than Britain, they could not have been any of the Spanish islands, none of which is more than ten miles from the mainland. Off Vigo is Ons, where, according to Cornide, some "indications" of tin-bearing quartz have been found, but this will not suffice to mark the former seat of an important mining industry.

It is true, according to W. C. Borlase,* the ancient tin workings of Gallicia are of considerable extent, so that it is possible that the earliest tin trade from the western extremities of Europe into the eastern Mediterranean may have been based upon shipments of metal from the land of the Artabri, from the estuaries of Ferrol, Arosa, and Vigo. Moreover, the islands off the Spanish coast may have been depots to which the Phoenicians brought the tin mined in Gallicia, or even in Brittany, but Strabo's Cassiterides were not in Spanish waters at all, they were far to the north in the open sea, in the same latitude as Britain. This points to the Scilly Isles, the identification of which with the tin islands of Herodotus has been completed by the "Encyclopaedia Britannica," in which, under "Phoenicia," we are told that the Cassiterides "were discovered to be, not a part of Britain as was imagined at first, but a separate group by themselves, now known as the Scillies; hence it is improbable that the Phoenicians ever worked in the tin mines in Cornwall." Thus a practical joke perpetrated by the Phoenicians more than 2,000 years ago has been played successfully on the writer in that august compendium of knowledge, the "Encyclopaedia Britannica." He, like the

* "Tin Mining in Spain, Past and Present," by William Copeland Borlase, 1897.

Greek authors, has allowed his respect for the written word to check his intelligent curiosity, for as a tin-producing region on a large scale, the Scilly Isles are silly indeed.

These islands constitute a small archipelago, forty in number, situated 25 miles west of Land's End, the Cape Belerion of the Greek writers. The largest of the Scilly Isles—St. Mary—is only two miles by three, from which one can see that Strabo's description hardly fits; the natives could not lead "a wandering life" with their cattle on an island of that small size, unless both they and their cattle were uncommonly vigorous swimmers.

Strabo's knowledge of the parts of Gaul facing the Atlantic and of the islands in the western ocean was vague; he appears to have obtained his information about the tin districts from the writings of Posidonius and Polybius. The merchants of Gaul could not, or would not, tell Caesar anything reliable about Britain when he sought such information on the eve of his expedition. It was not known to the Romans whether Britain was a promontory or an island. Distant lands were called "islands" by the ancients long before their real shape was ascertained. Little was known concerning the continuity of the coast from Kent to Cornwall. This ignorance may have explained the supposition that Cornwall, or Belerion, was a separate island. When that south-western promontory was first discovered it may have been thought an island, and thus it may have been regarded as a member of the group of islands to the westward, the Scillies. The Phoenicians probably knew better, but not their competitors, who did most of the writing in those days. Later, when the connection of Cornwall with the mainland of Britain was proved, the insular name may have survived, thereby confusing the historical record. If, by chance, the Phoenicians, sailing northward from Spain, landed first on one of the Scilly Islands, and if, as is less probable, they found the natives mining the tin ore on such an island, why should it be

supposed that they, who had sailed from Tyre into the Atlantic, would fail to adventure from the Scilly Isles to the neighbouring promontory of the Land's End, the Cornish mainland?

A few notes may be recorded concerning mining in the Scilly Islands. Borlase, writing in 1768, states :—

"I saw one vein at Trescaw. It might be two feet wide, on a cliff near a place called the Gunwell. There was a narrow one on the same island under Oliver's Battery. The former had been worked for tin, and had several shafts and burrows in the course of it, the only ones in Scilly; the other we could perceive no metal in."

This reminds one of the old lady's injunction that "a preposition is a poor thing to end up a sentence with." Polwhele, writing in 1793, says:

"On the downs in the isle of Trescaw we saw a large opening made in the ground and dug about the depth of a common stone quarry, and in the same shape."

In the face of such statements it cannot be denied that tin has been mined in Scilly; moreover, no information is available concerning the stream tin, or alluvial deposits, from which probably most of the tin was anciently derived. Another interesting fact is the subsidence of these islands, suggesting that at one time they were of considerably larger extent. Borlase writes:

"Many hedges now under water, and flats which stretch from one island to another, are plain evidences of a former union subsisting between these now distinct islands. History speaks the same truth. 'The isles of Cassiterides,' says Strabo, 'are ten in number, close to one another; one of them is deserted and unpeopled, the rest are inhabited.' But see how the sea has multiplied these islands: they are now reckoned more than 140, into so many fragments are they divided."*

* [On this subject see an article by Mr. O. G. S. Crawford, F.S.A., in "Antiquity" for March, 1927.—Editor.]

The question arises, when is a rock large enough to be designated an "island"?

William Pryce, in his "Mineralogia Cornubiensis," published in 1778, has something to say on the subject. Not only did he understand the technique of tin mining and smelting in Cornwall, but his book proves him to have been a student of the classics and a sagacious commentator. A Cornishman himself, he is well qualified to speak on the matter. According to him, the Phoenicians went to Cornwall fully 600 years before the Christian era; they erected forts to protect their commerce, and they left many Syriac names to mark their residence in Cornwall. As to this, there is reasonable doubt. Concerning the Scilly Isles, Pryce says: "The islands of Scilly are merely in their present state a cluster of barren rocks, the principal of them measuring but three miles long and two wide." The vestiges of tin mining in the Scilly Isles are slight and unconvincing, he says; only in one locality is there even the appearance of mine workings; and, he adds, "so necessary an appendage to a mine as an adit [or gallery from the outside] to unwater the workings is not to be seen in all the islands." If the tin was derived from alluvial deposits, then we ought to find, says Pryce, some vestiges of the veins from whence such detrital tinstone was "dismembered by the deluge." Pryce wrote before Lyell. He concludes thus:

"We are, therefore, strongly induced to believe that the mineral ore of tin was anciently procured within the four western hundreds of Cornwall, and there smelted into white tin, by charcoal fires, as the want of a proper bitumen [coal] in those days, and the entire demolition of all the woods near the tin mines, very plainly evince."

It can be argued in behalf of the Scilly Isles, as in behalf of the Oestrymnic group, that the encroachment of the sea may have submerged the evidence of ancient mining operations, which may have been on a scale larger than that

of any surviving workings. Geologic evidence, it is true, indicates a subsidence of over 60 feet along the south-western coast of Cornwall, and therefore, probably, of the Scilly Isles also. The geologist, however, is unable to give the date of the change in terms of human chronology, as we shall see when we come to discuss the age of the submerged forests. The tradition of a sinking of the land in days gone by has given rise to various mythical stories, such as that of the legendary country of Lyonesse, where dwelt King Arthur and his knights. William of Worcester, in the 15th century, speaks of it; and Richard Carew, writing in 1602, describes in detail the flourishing state of Lyonesse before, like another Atlantis, it was ravined by the encroaching sea. They tell fanciful tales of fishermen that at low tide saw the tops of houses and " casting their hooks thereabouts have drawn up pieces of doors and windows." A poet to-day looking westward at sunset from the Land's End towards the Scilly Isles, which seem but shadows on the summer sea, might hear the bells of the drowned spires of Lyonesse; but the geologic evidence of raised beaches along the coast indicates that probably before man arrived in Britain the Scillies and the Land's End were already separated by a sea that was quite as wide as it is now.

Evidently the Greek historians, and the later Roman writers likewise, had only a vague idea of the geography of the tin islands; to them the " Cassiterides " meant a region insular or peninsular, somewhere at the western extremities of Europe. Those who bought the tin did not know exactly whence it came; those who sold it took pains to wrap its source in mystery, desiring to retain the trade for themselves. We, however, on the evidence of economic geology, are justified in believing that the tin came chiefly from Cornwall.

If then we conclude that the Cassiterides was the region of southern Cornwall, including possibly the adjacent islands of Scilly, we have yet to ascertain the identity of

the island of Ictis. Diodorus, it will be recalled, says that the natives took the tin to " an island lying off the coast of Britain called Ictis, for at low tide the ground between is left dry, so that with carts they carry the tin in quantity to the island," whence the merchants took it to Gaul, and carried it on horseback overland to Massilia.

The Greek historian obviously is impressed by the phenomenon of a high tide, for he remarks: " There is something peculiar that happens to the islands in these parts lying between Europe and Britain, for at the full tide, the intervening passage being overflowed, they look like islands; [but] when the sea retires, a large space is left dry, and they appear as peninsulas." To a dweller on the shores of the almost tideless Mediterranean such as our Sicilian writer, the ebb and flow of the tide on the Atlantic coast was extraordinary in its amplitude. That is why Diodorus emphasizes the variant status of Ictis as a half-island. Here I may quote the well-known remark of Thucydides* that the Phoenicians " fortified headlands on the sea-coast of Sicily and settled upon the small islands adjacent, for the purpose of trading with the Sikels," or natives of that island. It is obvious that to the early sea-rovers an island was a place immune from sudden attack, and that its lee side gave shelter from the storm; thus it afforded a convenient centre for trade with the natives on the mainland. A large island, however, would not serve the purpose so well as a small one, because the approaches to it could not be watched or guarded conveniently. This is an argument against Thanet and the Isle of Wight, but in favour of St. Michael's Mount.

Diodorus Siculus, as we have seen, tells us that the metal merchants met the tin miners of Cornwall upon an island that at low tide was connected with the shore by a causeway of firm sand over which the carts passed safely

* History, VI, 2.

from the mainland to the island, which was named Ictis. The Sicilian historian, who wrote shortly before the beginning of the Christian era, had never visited Britain, so his description must have been taken from an earlier writer. This probably was Posidonius, a geographer to whom both Diodorus and Strabo are much indebted. Posidonius wrote in about 90 B.C.; so we conclude that Ictis was the metal market in about 100 B.C., or about fifty years before Caesar's first invasion of Britain.

Where was Ictis? This question has provoked another lively controversy. Among the places put forward as claimants to identity with Ictis are Drake's Island (in Plymouth Sound), the Wolf Rock (off the Land's End), the Black Rock (in the Fal estuary), the former island of Thanet, the Isle of Wight, and St. Michael's Mount. The first three need not be considered as presenting any serious claim to the honour. Thanet, the promontory of the North Foreland, is now a part of the Kentish mainland, but so lately as the 15th century it was circumnavigable, being separated by Wantsum Strait, through which vessels coming from the French ports sailed into the estuary of the Thames. Elton* argues that Thanet was Ictis, partly on the evidence of geologic change and partly because Caesar crossed the Channel from Portus Itius, which is supposed to be Wissant, near Cape Grisnez. The tin, he assumes, was carried from Britain to Gaul across the narrow part of the English Channel. The suggestion has been made also that if Thanet be the place where the merchants traded for tin with the Britons, then we might have an explanation of Caesar's remark that the metal came from the interior of Britain; but Caesar's remark calls for no such supposition. Why should the natives carry the tin to a port on the eastern coast when they could meet the merchants at a place so much nearer the mines? At the time when either

* "Origins of English History," by Charles Elton, pp. 35-39.

Diodorus or Posidonius wrote there were no roads available for such a journey; on the contrary, we have reason to believe that the country between Kent and Cornwall was both thickly wooded and inhabited by various mutually hostile tribes.

Next we come to the Isle of Wight. According to Pliny, the historian Timaeus (350-326 B.C.) said that "six days sail inward from Britain there was an island named Mictis on which white lead [tin] was found; and to this island the Britons came in boats of osier covered with sewn hides." This obscure passage has caused much trouble; the fact that Mictis resembles Ictis, and that both look like possible variants of Vectis, which was the Roman name for the Isle of Wight, has led sundry writers to infer that the ancient tin market was there. If Mictis was on the coast of Britain, it could not be six days sail therefrom, for, it must be noted, Timaeus is not speaking of Belerion, but of Britain itself. If, on the other hand, the Britons themselves sailed in their coracles to the island, then it was not Ictis, because that island was reached by them, so we are told by Diodorus, over a causeway suitable for the passage of the carts that carried the tin from the mines to the market where they met the merchants so amicably. The suggestion has been made, by Müllenhoff,* that Pliny confused the distance from Mictis to Britain with that of Britain from Thule, or Ireland, of which he had just been speaking. As it is, the statement of Timaeus is so cryptic in its geography as to be unintelligible; Pliny himself seems to treat it as fabulous. Ridgeway thinks that "Mictis" was "a clerical error" for Ictis, and that the step from Ictis to Victis was easy phonetically. Verbal analogies are proverbially dangerous; in this instance they would be of small account if sundry geologists, led by Clement Reid, had not come forward with the positive assertion that the

* "Deutsche Altertumskunde," 1890, I. 472.

Isle of Wight was an island of the character described by Diodorus about two thousand years ago. Reid, in his revision of the geologic map of the northern part of the Isle of Wight, for the Geological Survey of Great Britain, says* that two thousand years ago the island was joined, near Yarmouth, to the mainland by means of a ridge of limestone; at the time when Diodorus wrote, this natural causeway, Reid asserts, was already worn away by the sea, so that it could be used only at low tide. Another authority on coast erosion, W. H. Wheeler, says:† "There is clear evidence that the Isle of Wight at one time joined the mainland at its western end, the chalk cliffs and the Needles forming a continuation of those of the same geological character in Dorsetshire, the Solent being the estuary of the several rivers that flow into it from the Isle of Wight and Hampshire." In proof, he mentions the bank of shingle under the headland of Hurst Castle as the vestige of a former geologic structure. This is said to have retained its shape since the days of Henry VIII. A third geologist, E.M. Ward, says‡ that the chalk downs extended formerly from the present mainland to the Isle of Wight; the downs were breached by the sea "probably along the valley of a northward-flowing tributary of the Solent river," but a land connection across the present western entrance of the Solent continued into prehistoric times. Reid mentions a tradition long current on the Isle of Wight that it used to be connected with the mainland. Such is geologic change; peninsulas become islands, straits become pathways; here the sea gains, there it loses.

"Where argosies have wooed the breeze
The simple sheep are feeding now;
And near and far across the bar
The ploughman whistles at the plough;

* "Archaeologia," LIX, 281.
† "The Sea-Coast," p. 162.
‡ "English Coastal Erosion," p. 79.

Where once the long waves washed the shore
Larks from their lowly lodgings soar."

Of course, the Isle of Wight was once part of the mainland and equally of course at some time it was a peninsula, even in such physiographic transition as to be, like the Ictis of Diodorus, separated by the sea at high tide and connected by a causeway of rock or sand at low tide. The tradition of its former more substantial status, as an integral part of the mainland, requires only the exercise of the constructive imagination and some slight appreciation of geologic evolution. Most assuredly the Isle of Wight at some time in a past geologically recent and historically remote was a half-island; but when the geologist undertakes to tell the archaeologist that such was the case exactly two thousand years ago, he is assuming a precision that is without scientific justification. Other geologists, with a keener appreciation of the difference of scale between the geologic record and human history, assert confidently that although, naturally and obviously, the Isle of Wight formerly underwent the transition between an island and a peninsula, the date of that transition belongs to the prehistoric period, which means more than two thousand years, and probably more than five thousand years, ago. Aubrey Strahan, subsequently Director of the Geological Survey, in testifying before the Royal Commission on Coast Erosion in 1906, stated his disbelief that the Isle of Wight had been connected with the mainland "within historic times." With this conclusion most geologists will concur. I shall return to this question of chronology later. It suffices here to say that we have no geologic evidence that the Isle of Wight in the days of Diodorus or of Posidonius was other than an island such as it is now. Literary evidence is confirmatory. Bede in about 730 calls attention to remarkable tidal phenomena in the Solent; this suggests conditions such as those to be observed there to-day. Moreover, Bede says that the account of the conquest of

the Isle of Wight by Vespasian in A.D. 43 does *not* represent it as a peninsula at low water.*

We may ask of those who identify the Isle of Wight with Ictis, as of those who support the claim of Thanet, why should the tin have been brought to the Isle of Wight before shipment to Gaul, on the way to the Mediterranean ports? Diodorus says nothing to suggest that the tin was carried overland through Britain to a distant British port; on the contrary, he suggests a contrast between the sea journey from Ictis to Gaul and the land journey across Gaul to Massilia or Narbo. The tin, it seems, was carried from the near-by mines to the coast opposite the island and over the causeway at the ebb of the tide to the vessels that were moored in a cove on the shore of Ictis.

Next we come to St. Michael's Mount, a rocky island that lies off Marazion in the bay made by the promontories of the Land's End and the Lizard. When the tide is out, this island can be reached dry-shod over firm sand, along which carts pass to this day; it is opposite the only part of the southern coast of Cornwall where nowadays such vehicles can descend conveniently to the beach; moreover, within twelve miles westward and eighteen miles eastward are included most of the old tin-mining districts of Cornwall. Why should not this be the Ictis of Diodorus? Indeed, St. Michael's Mount fits his description so well that one would be justified in accepting the identity in default of clear evidence to the contrary. The adverse evidence is partly literary and partly geologic. Perhaps it is not unfair to say that the one has coloured the other. Reid, for example, states: "As far as can be calculated from its known rate of encroachment, the sea cannot have reached the Mount till long after the Roman period, and the legend is probably quite accurate." This legend is one that refers to St. Michael's Mount as a grey rock in a

* "Ecclesiastical History of the English Nation," Book I, chap. 3.

wood. Reid continues: "The Mount was surrounded by a wide marshy flat covered with alders and willows till well within the historic period." Ward is of the same opinion: "Judging," he says, "from the recent rate of the sea's advance here St. Michael's Mount must have merited its Cornish name of the 'hoar rock in the wood' and risen as a granite hillock above a marshy forested plain long after the Phoenicians had traded purple cloth for tin in Ictis and gone the way of all peoples." Elsewhere he says, more precisely, that the Mount "three thousand years ago, was still some distance from the sea." Presumably therefore the Phoenicians traded with the tin miners long before three thousand years ago! However that may be, it is apparent that these two geologists, who agree in stating that the Isle of Wight was a half-island exactly two thousand years ago, are also of one mind concerning the precise geologic status of St. Michael's Mount shortly before the beginning of the Christian era.

The legend of the former condition of the Mount is recorded in the Cornish saying, *cara clowse in cowse*, the hoar rock in the wood. The phrase is preserved as "*carrack loos en Kuz*" in John Boson's pilchard song of about 1700; but an earlier mention of this Cornish tradition appears in Camden's "Britannia," published in 1586, and in Richard Carew's "Survey of Cornwall," published in 1602. Carew speaks of "the countrie of Lionesse which the sea hath ravined from Cornwall between the Land's End and the Isles of Scilly," and then remarks, "moreover, the ancient name of St. Michael's Mount was *cara clowse in cowse*, in English, the hoare rock in the wood; which now is at everie floud incompassed by the sea; and yet at some low ebbes, rootes of mightie trees are discryed in the sands about it." The legend that the Mount once stood in a forest can be traced to an even earlier writing; more than a century before Carew's time it appears in an itinerary of William of Worcester, who

not only gives the Mount the name of "hoar rock in a wood," but states explicitly that it used to be six miles distant from the sea, and was surrounded by a dense forest.

William of Worcester was born at Bristol in 1415; he was educated at Oxford in about 1434; and his "Itinerarium" is dated 1478. In that casual chronicle he says that there was "an apparition of the Archangel St. Michael in Mount Tumba, formerly called the hore rock in the wodd." As Max Müller has shown,* the name Tumba belonged originally to Mont St. Michel in Brittany. The Cornish mount was known at first as Dinsul,† the present name having been given to it in 1085, shortly after the Norman conquest, when it became an appanage of the monastery overseas. "There," as Müller says, "a famous and far better authenticated apparition of St. Michael is related to have taken place in the year 708, which [event] led to the building of a church and monastery by Autbert, Bishop of Avranches." The story of the saintly apparition is recorded by Mabillon in his "Annales Benedictini," where it is quoted from an author that wrote before the middle of the 10th century, that is, "before Duke Richard had replaced the priests of St. Michael by Benedictine monks." The name Tumba, meaning a hillock, was given to the Breton mount because it emerges from the sands "like a hill," as says the author quoted by Mabillon; in medieval days the church and monastery of St. Michel were described as *in monte Tumba*. After the Norman conquest the Cornish mount was granted to the Norman Abbey of St. Michel, and the connection continued for many centuries. Thus it is easy to understand, as Müller suggests, how a monk brought from the abbey on Mont

* F. Max Müller, "Chips from a German Workshop," 1870, Vol. III, pp. 330-357.

† [This is disputed. The name only occurs once, in a Life of St. Cadoc in a late 12th century MS. (Cott. Vesp. A. xiv.) and Mr. C. G. Henderson has suggested reasons for identifying Dinsul with Denzell in St. Mawgan-in-Pydar.—Editor.]

St. Michel to the Priory on St. Michael's Mount might, when an old man, repeat the legend of St. Michael and Bishop Autbert; indeed, there is good reason to believe either that William of Worcester, when on his visit to St. Michael's Mount, was shown an old book from Mont St. Michel or that parts of the book were read to him by a venerable monk, for he uses phrases that appear in the writing of the Norman chronicler quoted by Mabillon. William of Worcester's "Itinerary" as published at Cambridge in 1778 contains a passage reading as follows: "*Predictus locus opacissima primo claudebatur sylva, ab oceano miliaribus distans sex.*" In the old chronicle of the 10th century we find the phrases "*opacissima olim silva clausum*" and "*ab oceano miliaribus distans sex,*" so that the source of the local tradition is unmistakable. The rocky mount that was originally surrounded by a dense forest and that was six miles from the sea was Mont St. Michel in Brittany, not St. Michael's Mount in Cornwall. The tradition of the hoar rock in the wood has received the endorsement of several geologists, as we have seen, because near St. Michael's Mount, on the shore between Marazion and Penzance, there had been found a submerged forest, as recorded by Carew. The knowledge of the submerged forest served to foster the old tradition. No one would apply the name of hoar rock in a wood to the Mount as it now stands, so the inference is made that the name was given before the submergence of the ancient forest by which it is supposed to have been surrounded in ancient days.

St. Michael's Mount is a mass of granite measuring five furlongs in perimeter and rising to a height of 195 feet above mean tide. If the surface in this locality were raised permanently 13 feet, the isthmus would be constantly above the sea, and the Mount would become permanently a peninsula; if lowered seven feet, the isthmus would always be under water, and the Mount for ever an

island.* At high tide the distance from the Mount to the Marazion cliff is 1,680 feet. William of Worcester's estimate of the distance of the Mount from the mainland differs little from this figure. According to Leland, writing in 1533-1540, the Mount in his day was in its present condition, and it was no larger then than it is now. Bishop Lacy's encouragement to the faithful in 1425 to complete the causeway between Marazion and the Mount, for the purpose of protecting wayfarers and shipping, indicates that the exposure of sand along the isthmus was about the same as now. Finally, we have the less certain evidence of Edward the Confessor's charter of 1044 describing the Mount as *juxta mare*, or by the sea.

The Irish name, *Ict*, for the sea between Britain and Gaul, may have been derived from the name of the Diodorus island, or the nomenclature may have been reversed. In the life of St. Declan mention is made of the *mare Ycht quod dividit Galliam et Britanniam;* and the life of St. Ailbe uses nearly the same words. Moreover, Irish tales of early date call the English Channel the *muir n-Icht*, or Sea of Ictis. That goes some way to explain the name of the port, Itius, near Calais, as mentionod by Elton in his attempt to prove that Thanet was Ictis.

This literary evidence, however, is less critical than the geologic, the chief of which is the submerged forest, a relic of the past that, as we have noted, has made a strong appeal to the imagination of various writers successively. Leland mentions the buried forest in about 1535, Borlase drew attention to it in 1757, and Carne in 1845. The last says:† "A mass of decayed plants full of small branches, twigs, and leaves, generally of hazel or birch, forming a spongy brown substance, occurs under four inches to

* W. Pengelly, "The Insulation of St. Michael's Mount," Royal Institution of Cornwall, 1872.

† Joseph Carne, Transactions Royal Geological Society of Cornwall, Vol. VI, p. 230.

one foot of fine sand, on the east of Penzance, continuing for half a mile from east to west, and being in its most southern parts, as far as ascertained, twenty or thirty feet below spring-tide level. Numerous prostrate tree-trunks, amongst which oak was noticed, were embedded in brownish earth full of woody fibre, beyond the pile of rocks near the Chyandower river." Elsewhere he makes it clear that this fossil wood consists of oak, willow, and hazel in black earth, now three hundred yards beyond the reach of the sea. At high water this submerged forest has 12 feet of sea above it. Most of it is covered with beach sand, which thickens eastward. At Huel Darlington, near the Marazion river, a layer of trees, chiefly oak and hazel, prostrate, lies underneath 12 feet of white sand, four feet of peat, and eight feet of slime and gravel. The remains of this forest rest upon three feet of peat, below which comes four feet of alluvium containing detrital tinstone, lying upon a bedrock of slate. This, again, indicates a subsidence of the land relative to the sea, and confirms the evidence of the buried forest to be seen along the shore of Mount's Bay. The submergence of the land, as proved by the forest beds, is emphasized by the finding of other alluvial deposits of tin underneath them, as at Carnon and Pentuan, both in the eastern parts of Cornwall. At Carnon the fossilized vegetation is covered by 50 feet of slime and sand containing marine shells; at Pentuan the tin gravel is blanketed by 40 feet of sediment. In both localities human skulls have been found in the vegetal remains. The submergence, therefore, as Lyell has said, was effected "in part, at least, since the country was inhabited by man." The skulls do indeed prove it, but they do not indicate a date within the historic period.

Similar submerged forests have been found in many other localities, not only in the part of Cornwall adjacent to St. Michael's Mount, but in other parts of the county, northward, and in Devon also. Moreover, the finding of

such forestal beds in eastern England points to a period during which the entire southern coast underwent subsidence; and it was during this period that St. Michael's Mount became a half-island. Submerged forests have been disclosed along the coast of England all the way from Holyhead to Lowestoft. Evidence farther afield, for example, along the Dogger Bank, in the North Sea, indicates that any one of these local submergences, such as that observed in Mount's Bay, was merely a minor phase of a slow and extensive geologic movement that included not only the British Isles but the western extremities of continental Europe. We are dealing not with a local phenomenon peculiar to the vicinity of St. Michael's Mount but with a process of terrestrial evolution on a grand scale. As De La Beche said,* many years ago, it is "doubtful how far this submarine forest affords any support to the old traditional name of the Mount." This doubt is confirmed by further investigation.

The submerged forest at Torbay, in Devon, a geologic relic similar in character and in stratigraphic position to the one near St. Michael's Mount, contains bones of the mammoth and the long-fronted ox, both of which were extinct in the days of the tin trade to which we are referring. The deposition of successive beds of silt and sand to a thickness of as much as 70 feet, containing marine shells, and indicating therefore slow deposition in the sea, above these submerged forests, argues a lapse of time not to be measured by a few centuries, but by several thousand years. Here again we face the difficulty of delimiting geologic change in terms of human chronology. Reid estimates† that the subsidence that submerged parts of the coast of Norfolk ceased about 2,500 years ago, and to the submerged forest in Bideford Bay, Devon, he gives an antiquity of 3,500 years. Another geologist places the date

* "Report of Cornwall," 1839, p. 418.
† "Submerged Forests," p. 26.

of submergence of such forests on the south coast of England at about 4,000 years, with a plus or minus, be it understood, of one thousand; and this estimate, although not precise enough for the archaeologist, suffices, as likewise the estimates of Reid, to place the Ictian phase of St. Michael's Mount well within the 2,000 years that have elapsed since Diodorus wrote.

Ward speaks confidently of the subsidence as Neolithic, and Reid refers* to the submerged forest at Porth as "probably Neolithic." In the forest beds of the Fenlands (in Norfolk and the adjacent region) there have been found implements of polished stone, together with the bones of extinct animals—in other words, the relics of Neolithic man and of post-Glacial mammalia. That indicates an age of more than 2,000 years, although no cautious palaeontologist would care to say whether it was 3,000 or 5,000. To the geologist a thousand years is as a decade to the archaeologist; the discrepancy in their units of time has prevented the geologist and the archaeologist from seeing eye to eye on this question of the insulation of St. Michael's Mount. There was a subsidence of the land in the vicinity, but when did it cease? The submergence of the forest occurred in a period known to the geologist as "Recent," but the geologist's "Recent" differs enormously from the historian's "recent." Speaking of Mount's Bay, Reid has testified that "this part of Cornwall has suffered more than any other from the action of the sea." Yes! but when? Elsewhere the same scientific writer† emphasises the fact that the position of a Roman tin jug, found near Mevagissey, three feet below the present surface, just beyond the reach of the highest tide and resting on sea sand, proves that in Roman times the sea-level in that

* "The Geology of the Country near Newquay," Memoirs of the Geological Survey, p. 71.

† "The Geology of the Country around Mevagissey," Memoirs of the Geological Survey, 1907, p. 61.

locality was almost the same as now. We have other reasons for believing that when Caesar invaded Britain, and when Diodorus was writing, the Mount was as it is to-day.

Thanet was not Ictis, but the physiography of Thanet throws light upon the question of the geologic status of St. Michael's Mount; and helps to confirm our belief that the Mount was Ictis. Thanet was insulated by Wantsum Strait, as we have seen, until the 16th century. According to Bede, a ferry plied between Thanet and Kent in the 7th century, the estuary at that time being nearly half a mile wide at high tide. It was not silted completely until the reign of Henry VIII. The silting of the channel had begun during the Roman period, which fact proves an absence of subsidence at that time. The similar and contemporaneous gain of the land along the coast of Sussex, causing several of the old Cinque Ports, such as Rye and Sandwich, to lose their maritime approach, is due chiefly to silting behind bars of shingle and to the effects of reclamation; it may not therefore prove an elevation of the shore, but at least it proves an absence of subsidence for more than a thousand years and probably since the Roman occupation. The Roman works at Porchester, near Portsmouth, are situated upon a low peninsula; they were "obviously designed," says James,* "with reference to the present configuration of the land and the present level of the sea," and without reference to the submerged forest in the vicinity. The Roman station at Bittern Manor, the Clausentum of Roman days, on Southampton Water, existed at the beginning of the Christian era, but it indicates no subsidence since that time.

Thus, in these various facts, we have something more than a suggestion that the subsidence to which the submergence of the forest near Marazion is due had ceased

* Henry James, Reports of the Royal Institution of Cornwall, 1859-1863, Appendix, p. 31.

nearly 2,000 years ago, and, therefore, that St. Michael's Mount is *in statu quo* as regards the days of Diodorus, or of Posidonius. Geologic changes can not be stated with precision in terms of human chronology unless archaeological evidence is available, because any attempt at precision must be based upon the assumption that natural operations such as erosion and sedimentation, or subsidence and elevation, take place at a known uniform rate of speed. Such an assumption is rarely justifiable.

We may conclude therefore that the geologic argument, with the legend that incited it, against the identification of Ictis with the Mount, is untenable. The resemblances between this Cornish port and that described by the Greek historian are obvious, as Dr. Barham pointed out many years ago.* It was conveniently near the mines; it was a place of security against sudden attack; it was approachable by a gentle descent from the adjacent shore; it offered shelter on the lee side of an island. The statement of Diodorus that the tin miners were friendly to strangers, and that they had become civilized in consequence of their intercourse with the metal merchants, indicates clearly, as Rice Holmes has insisted,† that Ictis was within, or close to, the mining region of Belerion. Moreover, we are told by Diodorus that the tin was taken overseas to Gaul and then transported overland to the Mediterranean; it was carried to "that part of Gaul which is opposite" and then it was borne "across the midlands of the Celtic country."

We have clear testimony, as we shall see later, that the port of entry into Gaul was at the mouth of the Loire. The estuary of the Liger, as the Romans called the Loire, was conveniently opposite the tin region of Cornwall. A look at the map will confirm this statement. By going

* T. F. Barham, Royal Geological Society of Cornwall, Vol. III, p. 86.

† T. Rice Holmes, "Ancient Britain," pp. 493-507.

thither, passing west of the Breton promontory, the early traders had a comparatively direct and safe route from the tin market at Ictis. To have taken their product by sea to the Isle of Wight, for subsequent re-shipment to the Gallic port on the Loire, would have involved a journey not only thrice as long but much more dangerous, through the Channel Islands and around Ushant. Moreover, every Cornish fisherman knows that the prevailing wind is from the west, therefore a vessel voyaging southward between Mount's Bay and the Loire could come and go on one tack, whereas the voyage to the Isle of Wight would require the navigator to run with the wind thither and to beat against it by means of repeated tacking on his return. It may be suggested, of course, that the tin was carried from the Isle of Wight or from Thanet to a port at the mouth of the Seine, for example, but we have no evidence to this effect, whereas we have the positive statement of Polybius and Strabo that the tin was imported at the mouth of the Loire, which gave immediate access to " the midlands of the Celtic country."*

Thus, finally, in arriving at a just conclusion concerning the physiographic status of St. Michael's Mount in the days of Diodorus we come back to the opinion expressed by the father of modern geology. In his " Principles of Geology," published in 1867, Lyell says: " It becomes a matter of surprise that we should find a single point where the outline of the present coast can be demonstrated to have remained for nineteen centuries unaltered. For this reason St. Michael's Mount deserves our special attention, for it can be shown that all the characteristic features in its physical geography have been retained throughout that long series of centuries identically such as they are now."

* [The μεσόγειος Κελτική of Diodorus is probably the " Celtica " of Pliny (Nat. Hist. Lib. IV, C. 17), described by him as being between the Seine and the Garonne. The Loire ran right through the middle of it.—Editor.]

He remarks that the Mount " still affords a good port, daily frequented by vessels, whence cargoes of tin are sometimes taken on board, after being transported, as in the olden time, at low tide across the isthmus."

Let us now return to Strabo's references to the trade of the Britons. What was the metal that they imported, in exchange for the tin, at the beginning of the Christian era? Strabo uses the word *χαλκώματα*, which might mean things made either of copper or of bronze, and Caesar uses *aes*, which likewise might signify either copper or bronze. However, as bronze was the more valuable, and the more suitable for trade, we may infer that it was the metal imported, in the shape of trinkets. This would prove that the natives at that time were not aware of their own resources in copper, and serves to confirm the supposition that their tin was derived from alluvial deposits, because, if their tin had come from the veins themselves, not from the gravel, they would have found the copper as well as the tin, both of which abounded in close association in the veins of Cornwall. Even native copper was to be found at the grass-roots.* Pryce says: " Copper is frequently found in our mines near the day or surface, or commonly but a few fathoms deep." In later times the mining of copper in Cornwall became as important as that of tin. Even if the ancient Britons were exploiting the alluvial deposits only, one might suppose that some bits of heavy copper mineral, or of native copper itself, would become mixed occasionally with the tinstone, and thereby lead to the accidental smelting of the alloy. Perhaps this did happen, but to an extent so slight or with a frequency so rare, that the effects of the admixture were not recognized.

Crassus, as we have seen, is reported to have said that the islanders worked the tin ore without difficulty because it lay near the surface. This confirms the reason-

* The museum at Truro contains many beautiful specimens of native copper, found in Cornwall.

able inference that the Britons worked the stream tin, which is the tinstone (or tin oxide) concentrated by the natural agencies of erosion and gravitation in the gullies and beds of rivers. Tinstone is more than twice as heavy as the common rock-forming minerals, so that it is easy to collect by simple washing operations in " tyes," or sluice-boxes, similar to those used by the gold miner. All the ancient workings found in Cornwall are in stream deposits. It is true, Diodorus seems to suggest mining in hard rock; he says " the ground is rocky, with earthy veins in which they make a passage." However, we are warranted in questioning the accuracy of this description, which the Greek historian obtained at second-hand. Strabo tells us that Crassus remarked how " the metals were dug at a little depth." Although the diggings in the alluvium were generally shallow, being designed only to reach the bedrock upon which the tin-bearing sediment lay, it may have been necessary in places to make trenches of considerable depth. The deepest that has been found is 36 feet. A trench of twenty or thirty feet would look deep to an unsophisticated observer; and some of the gravel was so compact as to suggest vein-rock to anyone not versed in these matters.

The tools available to the Britons of that day were made of wood and deerhorn; until they learned how to use metallic implements of bronze or iron they could not turn to vein-mining successfully, nor would they desire to undertake such difficult operations so long as they had ample scope in the gravel and detritus in which nature had concentrated the fragments of tinstone broken from the veins. Later they could engage in " shoding," a Cornish term applied to the search for the pieces of ore, called " float " by the American miner, that lie on the hillsides above the gulches and valleys in which the alluvium is deposited. The " shode " represents the larger pieces of fragmental veinstone that have not been moved far from their place of origin. Thus the ancient prospector, like his

successors, would be led eventually to the source of the stream tin, in the veins themselves. Pryce says that shaft-mining in Cornwall did not begin until 1450, but that does not preclude an earlier systematic effort to exploit the veins by means of levels and adits that penetrated the hillsides, and thus reached the ore at a considerable depth.

The finding of the slag-heaps left by the ancient miners in Cornwall suggests that the tin ore was reduced on the spot, the smelting being done in a hole in the ground by means of a charcoal fire and a pair of bellows. How tin could be smelted in this primitive fashion is indicated by the crude practice that survives to this day among the natives of Borneo. They dig a circular hole about twelve inches in diameter and throw burning charcoal into it; then they add handfuls of ore and charcoal alternately, the ore being reduced by aid of a blast delivered through two pipes of bamboo that pass underground. This blast is produced by a wooden piston set in the vertical hollow of a tree-trunk, into the lower end of which the bamboo tubes open. An even simpler method of smelting is described by Agricola* as being used for the reduction of bismuth ore during the 16th century. A trench, in sloping ground, was filled with brushwood, on which logs were laid. The wood was set on fire; and when the trench was full of glowing embers the ore was thrown upon them. More wood was added at intervals. The molten metal ran into a hole at the lower end of the trench, which was so placed as to be in the path of the prevailing wind, this being the only blast used in the operation. In the Belgian Congo the natives make their bellows of two bottles of antelope skin, each of them having an opening of two inches at one end, and at the other a transverse aperture eight inches long, the lips of which are rendered rigid by means of rods of bamboo sewn to the hide. This aperture serves as a valve, which

* "De Re Metallica," Hoover's translation, p. 433.

is opened and shut by the movement of the operator's hand. He lifts the bottle and at the same time admits the air, which he forthwith compresses; then he closes the valve and expels the air at the other end into the furnace through a tube of wet bark.*

The destruction of the forest facilitates the search for ore on the surface. Strabo quotes an observation of Eratosthenes, the geographer of Alexandria, concerning the copper district of Thamassos, in Cyprus: "Anciently the plains abounded with timber and were covered with forests, which prevented cultivation; the mines were of some service toward clearing the surface, for trees were cut down to smelt the copper and silver." Thus the miner helped the farmer in Cyprus; but usually the general destruction of the forests is anything but favourable to agriculture.

The Cornish still speak of Marazion, the little town on the shore opposite St. Michael's Mount, as Market Jew;† they refer to the ancient workings and ruins as Jews' leavings, Jews' houses, and Attal Sarsen. This last term means "pagan"; it is derived from "Saracen," a word used in the Middle Ages to designate pagan strangers; it does not refer to the Moors or Arabs. "Atal" means the waste or rejected rock from a mine, so Attal Sarsen means the waste left by the strangers that worked the mines in the olden time. This indicates the tradition that the tin was exploited by a people from the eastern shores of the Mediterranean; indeed, it has been suggested that the Tyrian merchants may have brought captive Israelites to work in the mines. Did not Joel, in 800 B.C., inveigh (III, 6) against the Tyrians in these words "The children of Jerusalem have ye sold unto the Grecians, that ye might remove them far from their borders?" This gives a little

* From a description given to me by Monseigneur J. De Hemptinne, at Elisabethville, in the Katanga.

† [Market-Jew really means Thursday Market; it is a corruption of the Cornish *Marhas-dédh-jeu*, Latin, *mercatus diei Jovis*.—Editor.]

colour to a fanciful assumption. The reason why the Jews are associated with the ancient workings is the fact that in the days of King John the tin trade in England was in the hands of the Jews, and they appear to have farmed the mines until their banishment in 1290 during the reign of Edward I.

The mention of the Phoenicians in connection with the Cassiterides has led to the assumption that the tin trade described by Strabo and Diodorus refers to the commerce of the Carthaginian colonists. This is an error; Diodorus does not say that the merchants who went to Ictis were Phoenicians; on the contrary, he is talking about the tin trade of his own day, by which time the Carthaginian commerce was a thing of the past. The merchants to whom he refers are those of Narbo and Massilia, who were Roman and Greek, not Phoenician. Strabo says that "formerly" the Phoenicians "alone" were engaged in the tin traffic, going to the islands from Gades, but that later the Romans discovered the route to the market, of which Crassus brought them specific information. The Phoenicians may have reached Cornwall as early as 600 B.C.* The distance from Cadiz is 1,200 miles. From Tyre to Carthage was 1,500 miles; and from Carthage to Gades, 1,000 miles. Strabo and Diodorus did their writing nearly a century and a half after the Phoenician power was shattered, for Carthage was destroyed by the Romans in 146 B.C. The previous conquest of Gades by the Romans, in 206 B.C., deprived the Carthaginians of their control of the Strait of Gibraltar; and though the merchants of Gades tried, as Strabo relates, to keep the secret of their trade route, they could not long exclude their competitors, the Greek merchants, from a share in the commerce. Strabo's Romans probably were of Greek race, resident in the southern parts of Italy, for, as Cary suggests, the real

* Bochart gives 904 B.C. as the date for the Phoenician discovery of the British tin.

Romans did not participate in the overseas carrying trade.

Thus the Greeks regained, in part, the western trade that had been theirs several centuries earlier. The first Greek to reach the Atlantic was Colaeus of Samos, who, in about 630 B.C., passed through the Strait of Gibraltar and reached Tartessus, the Tarshish of Biblical history. This Samian navigator accomplished his adventure by accident, as Herodotus tells us, a persistent east wind having blown him off his course when on the way to Egypt. Shortly afterward the people of Phocaea, another Ionic town, came to Tartessus and engaged in the Iberian (Spanish) trade. It is they who founded Massilia (Marseilles) in 598 B.C., and from this outpost they exploited the western markets even after the city of their origin was destroyed by Harpagus, the Mede, in 540 B.C. From the people of Tartessus they must have heard of the tin mines in the north, for the Tartessians, probably Cretan in origin,* were fearless sailors and did not hesitate to cruise along the Atlantic coast. They probably, before the Phoenicians almost obliterated even the memory of them, sailed to the Breton coast; and possibly they went as far as Belerion (Cornwall) for the tin that they sold to the traders from the eastern Mediterranean. The Phoenicians of Carthage, aided by the Etruscans, destroyed the Phocaean fleet at Alalia, in 535 B.C., after which date the Greek trade with Tartessus and the Atlantic coast was at an end. Thenceforth the Strait of Gibraltar was closed to the Greeks, so that the Phocaeans at Massilia could trade with western Spain only by land. Then the Phoenicians, having the monopoly of the sea-commerce beyond the Pillars of Hercules, controlled the tin trade of western Europe, this including several regions, notably northern Spain (the land of the Artabri), southern Brittany (Morbihan), and Cornwall (Belerion).

* Rhys Carpenter, "The Greeks in Spain," p. 31.

The maritime trade having been closed to the Greeks by the Carthaginians, and later by the Romans, when Carthage was destroyed, the merchants of Massilia began to develop a trade route across Gaul. It is to this, and not to the earlier Phoenician commerce overseas, that our Greek historian refers. The evidence of coins found in central and north-western France indicates that the overland trade began in the days of Pytheas, who, it will be recalled, was sent from Massilia on an exploratory voyage in 325 B.C. Bronze coins from Massilia, silver coins from Emporiae, and Gaulish imitations of coins issued by Philip of Macedon refer us to a period between 300 and 350 B.C., so that the traffic overland appears to have started between 300 and 350 B.C. It continued into the second century B.C., for Polybius, the Roman historian, writing in about 130 B.C., says* that "there was in ancient times an emporium called Corbilo, on the river Liger [Loire], but none of its inhabitants, nor those of Massilia or Narbo, could give Scipio any information worth mentioning on the subject of Britain when questioned by him, although these cities were the most important in that part of the country; and yet Pytheas has ventured on all those stories about it." The Scipio to whom Polybius refers was his famous friend Scipio Aemilianus (Africanus Minor). This gives a date of about 135 B.C. Strabo quotes Polybius thus: "The Liger, however, discharges its waters between the Pictones and the Namnitae. Formerly there was an emporium on this river called Corbilo, with respect to which Polybius, calling to mind the fabulous stories of Pytheas, has said: 'Although no one of all the Massiliotes that conversed with Scipio was able, when questioned by Scipio about Britain, to tell anything worth recording, nor yet any one of the people from Narbo or of those from Corbilo.'"

According to Desjardins, Corbilo is a name of

* History, XXXIV, 10.

Phoenician origin. The site of this ancient port on the Loire has been identified with St. Nazaire.* The Pictones had their chief city at Poictiers; and the Namnitae, at Nantes. The reference to Pytheas indicates that he was the source of the information given by Polybius. The ignorance of the Massiliotes may have been assumed for the purpose of withholding information concerning the trade route from a Roman competitor. Pytheas, being a Greek, had not been baulked in the same way. Even more interesting is the reference to the men of Corbilo, for it indicates that merchants from the Loire were residing at Massilia, this, in turn, confirming the belief that there was at that time a well developed trade route between the mouth of the Rhone and the estuary of the Loire. It is probable therefore that the merchants of Massilia established communication, overland, with the traders on the Loire, and through them with the tin miners of Britain not long after Pytheas brought them the necessary information; and we may conclude that this trade connection was maintained until the Romans destroyed Corbilo in 56 B.C., when Caesar was about to invade Britain and deemed it advisable to subjugate the people of that part of Gaul in order to secure his base. Corbilo was in the land of the Veneti, an energetic people, who mined tin in their own country and probably traded with their fellow miners across the water in Cornwall.†

The commerce in British tin, so long in the hands of the Greeks resident on the Mediterranean coast of France, appears to have been ended by Caesar's reprisals against the Veneti and his invasion of Britain, for we have no evidence that it survived into the days of Roman dominion in Britain; on the contrary, it remained dead for at least

* Couëron is another claimant. Vannes, in Morbihan, Brittany, is another port to which, it is suggested, the British tin was brought by the Veneti. The Roman name for Vannes was Dariorigum.

† J. Rhys, "Celtic Britain," pp. 47-51.

two centuries after the invasion. Strabo's failure to mention tin as an article of British exportation indicates that the trade had ceased in his day.

Caesar established a navy-yard at the mouth of the Seine. This may have marked the diversion of trade from the Loire, for Strabo describes such a route as existing in his day. He says: "The Rhodanus [Rhone] may be navigated for a considerable distance even by vessels of heavy burden, and it is possible to go farther into the country by means of other rivers that fall into it, such as the Arar [Saone] and Dubis [Doubs]. Thence the merchandise is carried overland to the river Sequana [Seine], down which river they go to the lands of the Lexobii and Caleti; and from there to the ocean; the distance then to Britain being less than a day's sail."

The Lexobii lived south of the Seine, and the Caleti on the north bank of that river.

The evidence, such as it is, favours the supposition that the tin trade in the days of Diodorus was effected through the Veneti at the mouth of the Loire. We have no proof that the Phoenicians ever came to Cornwall, although there is testimony to their voyaging as far as the coast of Britain; the Greek historians do not say that the old sea-rovers went to the mines; they refer merely to the Phoenician trade with the tin regions. Nor have we any explicit statement that the Greeks came in direct contact with the tin miners; even Strabo's story, concerning the Romans being diverted from the market, refers to the traffic from Gades; it does not speak of the mines themselves, and therefore it might well refer to an approach to the islands off the Loire where the seat of the tin trade had been established. Diodorus says that the tin carried to Ictis was bought by the merchants, but he does not specify who they were. On the whole, therefore, it seems reasonable to infer that the Carthaginians of Gades traded for tin along the coast of Iberia and of Gaul, as far as the

mouth of the Loire, where the Veneti were exploiting deposits of alluvial tin. These Veneti, probably, having a knowledge of tin and its value, had been to Cornwall, and there had either instigated the natives to dig for the mineral or had found them already engaged in that industry. So the Veneti may have developed a market for tin at the mouth of the Loire, selling not only their own small output of metal but also the larger supplies of Cornish tin, to the traders that came to their country either by sea from Gades or by land from Marseilles. This would explain why the Oestrymnides obtained a reputation as a source of tin and why the Greek writers had such vague notions concerning the identity of the Cassiterides.

Next comes the question, when did the ancient trade in tin begin? Cadiz was founded at least as early as 1000 B.C., and from that port the Phoenicians sailed into the Atlantic along the coast of Spain and France until eventually they reached Britain. We have no date for that event, unless it coincide with Himilco's voyage, in the 6th century B.C., or with that of Midacritus, somewhat earlier. The oldest direct testimony to the Phoenician provenance of tin is that of Ezekiel, who in 580 B.C., speaks of the tin that came to Tyre from Tarshish [Tartessus], in south-western Spain. This tin, it is probable, was mined in the country of the Artabri (or Gallicia), in the north-western corner of the Iberian peninsula. Herodotus, writing in the 5th century B.C., states that " our " tin, that is, the tin used by the Greeks, came from the Cassiterides. The mention of this fact is made in the passage (III, 115) in which he refers to the source of the amber as well; he says: " Of the western extremities of Europe I cannot speak with certainty, for I do not admit that there is a river called by the barbarians Eridanus that empties itself into the northern sea, whence, it is said, the amber comes; nor am I acquainted with the islands called the Cassiterides, from which we are said to get our tin. For, in the first place, the

name Eridanus manifestly is not barbarian, but Greek, and invented by some poet or other; in the next place, although I have enquired diligently, I have never been able to learn from anyone who has himself seen it that there is a sea on the farther side of Europe. However, both tin and amber come to us from those remote parts." It is not surprising that he should have known so little, as he states frankly, concerning the islands where the tin was obtained; how many historians of our day could tell us whence we derive our tin? By going out of his way to assert the Greek derivation of the name Eridanus, he leaves us to infer that the other name, Cassiterides, was not of similar origin, although Greek in its termination. Herodotus has been charged with a blunder in supposing that the Eridanus was in the amber country; some of his critics say that he was misled, in the first place, by the fact that Eridanus was a name given by the Greeks to the Po, in northern Italy, and secondly, by the fact that the amber came from the northern Adriatic, to which, of course, it was carried across Europe from the Baltic region. Others have assumed that Herodotus confused the Veneti, or Venetans, with the Venedi, a people living in Sarmatia, on the eastern bank of the Vistula. These conjectures, derogatory to the historian, are ill founded, for the name of Eridanus was not given to the Italian river until long after his time, and it is evident that he is referring to a river in the far north. The name of it survives in the Rhodaune, or Rhodanus, which empties into the Vistula near Dantzig, where amber is still found. This region was known to the Greeks as the Electrides because it produced the ἤλεκτρον or amber, just as the tin islands, or *Cassiterides*, took their name from κασσίτερος.

A century later Aristotle speaks of Celtic tin, and, still later, Scymnos of Chios extols the riches of Tartessus in her supplies of this metal from Celtica. These writers use κασσίτερος for tin, as did Herodotus, Hesiod, and Homer.

The mention of the metal in the Iliad takes us as far back as 900 B.C. Homer states that Cinyras, the King of Cyprus, presented Agamemnon with a breast-plate on which were bars of gold and tin. Cyprus was colonized by the Tyrians at a remote period, so that the metal on Agamemnon's corslet may have come to Cyprus through Phoenician trade. To Homer, tin was still a substance of unknown metallurgical qualities; apparently he was unfamiliar with the pure metal, for he assumes that it needs an admixture with lead or antimony to make it workable. Homer applies to Sidon the term "abounding in bronze," but there is nothing specific in his known writings to link tin with Phoenician merchants, although he mentions both; if the monopoly of the tin trade had been in the hands of the Phoenicians in his day he probably would have referred to the fact. Nor does Homer connect the Phoenicians with the tin trade, although he speaks of them as carriers between Egypt, Arabia, and Greece. He does not mention the Phoenicians when speaking of Tartessus, but says that the Phocaeans were the first of the Greeks to form commercial ties with that famous mart. So, although the fact that the Phoenicians, when they established themselves in the south of Spain, trafficked on the one side with the Greek world and on the other with north-western Europe, seems to be well authenticated as from the beginning of the 6th century B.C., it cannot be assumed that they were the first to bring tin from western Europe into the eastern countries of the Mediterranean.

Tin was imported into Phoenicia at least as early as 1300 B.C., for it was used in articles of elaborate design before the Trojan war, which ended in 1184 B.C. The Phoenicians were famous for their work in bronze before Gades was founded or Tartessus was colonized. In Egypt the earliest relic of pure tin is a finger-ring of the 18th dynasty, between 1580 and 1350 B.C. An inscription of the 6th dynasty (2500 B.C.) is claimed to show Aegean

foreigners importing tin into Egypt, but it is probable that the ingots represent lead. Bronze reached Egypt during the 12th dynasty, in about 2000 B.C. This accords with the evidence obtained by Schliemann at Hissarlik (Troy), for the metallic weapons found in the first two layers indicate only the beginning of bronze-making. Not until after the destruction, by fire, of the second city, in about 2200 B.C., does a tin-copper alloy of definite composition appear to have been made.* Similar contemporaneity must be given to tin in Babylonia, where the use of bronze for temple decoration appears in the time of Abi-Eshu, in about 2000 B.C. Sayce interprets an inscription of Sargon of Akkad as indicating that tin was obtained by this Sumerian monarch in 2750 B.C. from Spain. The inscription, which probably is a copy made in 2200 B.C., describes the geography of Sargon's kingdom, and specifies the limits of his rule. Sayce translates the line in question as follows:† "To the tin-land (Kugu-ki) and Crete (Kaptara), countries beyond the Upper Sea (the Mediterranean)." From this he infers that the tin-land is Spain. According to later investigation by Albright,‡ the reading should be: "The land of lead, Kaptara, lands beyond the Upper Sea." *Anaku*, the first word, means "lead" in the cuneiform character; but "lead" might signify either lead or tin, for neither then nor for many centuries later were the two metals kept distinct by the ancients. Petrie remarks that "tin certainly was not known as a separate metal in the West as early as the reign of Sargon." Albright proceeds to identify this land of lead with Greece, which is beyond the Upper Sea, or Aegean. He gives as a reason the fact that "in the third millenium lead was the principal medium of exchange in the extended Akkadian commerce of Asia Minor and Northern

* Dörpfeld ('Troja und Ilion,' Vol. I, p. 367) mistakes an accidentally impure copper for 'bronze.'

† "Modern Egypt," March, 1924.

‡ W. F. Albright, "Journal of the American Oriental Society," September, 1925.

Mesopotamia, as we know from the Cappadocian tablets and other early sources." He then makes the interesting suggestion that the reference is to the lead mines of Laurium, in Greece, which were exploited in the most ancient times.

A more trustworthy hint as to the provenance of the earliest tin is given by the discovery of the trade that existed between Crete and Khorassan as early as 2500 B.C. Strabo says that tin is found in the land of the Drangae, or Drangiana, a region that became known later as Khorassan and that used to extend into what is now Turkestan.* The Pumpelly expedition of 1904 found in a tumulus at Askabad, on the northern border of Khorassan, a number of potsherds with mottled markings closely resembling similar relics of early Minoan age unearthed at Vasiliki in Crete. The close resemblance between these bits of pottery indicates trade relations between the peoples of the places where they were found.† The necropolis of Yortan yielded pottery analogous to the early Minoan finds at Gournia and Vasiliki, both in Crete, where bronze appears suddenly, as at Hissarlik, in about 2200 B.C. At Elisabethpol, on the Armenian border, in Transcaucasia, another early contact with the Aegean Sea was established, as is proved by the relics of an ancient culture. Copper also is found in both Khorassan and Transcaucasia, so that the two components of bronze were available. Ancient tin workings exist near Tabriz in Persia, but near the Armenian border, at the western end of the Elburz mountains, and also near Astrabad, at the eastern end of the same range, on the frontier of Khorassan. A large tin deposit has been reported to exist at Anngert,

* Karl E. Von Baer (Archiv für Anthropologie, Vol. IX) states that he learned from Russian officials, in 1876, that old tin workings of importance existed 42 versts from Meschhed in Eastern Persia, or Khorassan.

† Sir Arthur Evans informs me, since the above was written, that in his opinion there is not the "slightest probability of a connection between Early Minoan Crete and Khorassan."

in the district of Karadagh, which is in Persian Kurdistan on the southern slope of the Elburz. The tin is associated with copper in the same ore. Large excavations are said to survive.

In studying this question of the ancient provenance of tin, it is well to remember that the metal was not used in large quantities in the countries of the eastern Mediterranean until about 1500 B.C. Apparently at that time there was a comparatively sudden increase in the supply of tin, to meet the demand for the making of bronze. This supply may have come from a region not recognizable now as the seat of an important mining industry, for it must be remembered, as Hoover suggests in a note to his translation of Agricola's "De Re Metallica," that the tin of the ancients may have been derived from alluvial deposits that were completely exhausted by them, leaving no traces of intensive operations. How a mining industry, once flourishing, can disappear, leaving scant signs of its former existence, is illustrated by the Irish goldfield in Wicklow, which was so productive in Neolithic time.

Another pregnant suggestion is a remark made by Thucydides, who said that the first commerce was by land, not by sea. The earliest tin is likely to have reached the ancient civilizations of the Tigris and the Nile by an overland route. To this I venture to add the suggestion that as the first use of tin was for making bronze, therefore it is likely that the earliest tin came from a region that produced copper also. The two metals occur in the same ore in many mining districts, and it is probable that this association accounts for the first production of bronze, by an accidental admixture.

The derivation of the Greek word for tin *κασσίτερος* has been used as a clue to the original provenance of the metal. In the passage, already quoted, in which Herodotus speaks of the distant regions from which the Greeks obtained amber and tin, he implies that whereas

" Eridanus " is of Greek derivation, " Cassiterides " is not. From this we may infer that Herodotus knew that *κασσίτερος* was a word of foreign origin, as modern scholars have ascertained on their own account. In Sanscrit there is a word *kasa* that stands for " bronze " or " metal vessel," and *kasthira* is used for tin. In Aramaic the same word appears as *kasteron*, and in Arabic it is *kasdir*. The word *kasthira* does not occur until comparatively late in Sanscrit; it may have been loaned from the Greek. In Assyrian, tin was *kizasaddir*, and in Akkadian it was *kasduru*. As Sayce says, the Arabic and Assyrian words for tin may have been borrowed from the Akkadian, or primitive Babylonian, language, " but more probably both words, together with the Akkadian, the Sanscrit, and the Greek, have been imported from a common source, which was perhaps one of the early languages of the Caucasus, where ancient tin mines have been found."

Siret tries to derive *κασσίτερος* from the Greek *taxeros*, meaning fusible, through *καττιτερος*. Reinach, quoting Mela's " *in Celticis* " and Aristotle's reference to " the Celtic tin,"* gives *κασσίτερος* a Celtic derivation, and refers to a Breton people named Cassi, and to such British names as Cassivellaunus. He argues that the name came from the region in which the Cassiterides were situated: in Celtic lands; only the termination of Cassiterides is Greek; it meant " far distant lands," infers Reinach.† All of which is ingenious, but no more, having regard to Sayce's research on the subject. The reference by Aristotle to the Celtic tin would seem to suggest that the Greeks of his day knew of some other source of the metal. Avienus derived tin from Mount Cassius, in south-western Iberia, but there are at least half a dozen mountains named Cassius in Asia Minor. When making guesses of this kind, it is surprising that none

* ' De Mirabilibus.' " They say that the Celtic tin melts more quickly than lead."

† " L'Anthropologie," 1899.

of those addicted to this dangerous game of verbal analogy have given credit to the Kassites as the derivators of *κασσίτερος*.* These Kassites, or Kasshu, as we know, invaded Babylon in about 1780 B.C., coming across the eastern mountains from the western part of Elam, now southern Persia, but their earlier home was in the Caucasus, a great mining region. On the other hand, the use of the word *plumbum* for tin by the Romans in the days of Pliny, and their ignoring of the Greek word for the metal, suggests that they obtained it, not by sea from the eastern Mediterranean or Asia Minor, but overland from regions with which they traded in Continental Europe, such as Northern Bohemia, where we find evidence of an ancient tin-mining industry.

The suggestion has been made by Cooley, among others, that the tin of Egypt and of the Mediterranean countries was imported from India. This fancy may have been fostered by the fact that so late as the 18th century of our era the zinc that came from the Orient was called "Indian tin," although its real name in those parts was *spiautre*,† or spelter. The large production of tin derived in modern days from Banca and Billiton, from China and the Malay States, has given rise to the idea of an association of the ancient tin trade with these regions. It is possible that tin was mined in the Malay Peninsula in Neolithic time, for axe-heads and celts made of stone have been found in the ancient gold and tin mines of Perak and Pahang. It is claimed, moreover, that traces of Phoenician culture have been detected in Sumatra and in the Malay Peninsula. The first appearance of tin in the Mediterranean synchronizes approximately with the migration of the Phoenicians from the Persian Gulf to the Syrian coast. They

* Since writing this, I am amused to find that two learned commentators, Hüsing and Pokorny, have suggested that *κασσίτερος* is derived from the name of the Elamite tribe.

† A Dutch word, originating in the Dutch East Indies.

may have become acquainted with the metal through trade with the Asiatic regions north of their old home. The Phoenicians introduced many of the words for metals from a Semitic source, such as the Greek χρυσός and χαλκός. Even the word μέταλλον for metal in general is derived from the Semitic *matal*. Likewise the derivation of the two Sumerian words for copper, *urudu* and *zabar*, takes us north-eastward.

How early the Phoenicians of the Persian Gulf traded with India and the regions adjoining, we do not know; but what evidence exists as to the importation of tin from the Orient to the Mediterranean countries is negative. Pliny says: "India has neither copper nor lead, but she procures them in exchange for her precious stones and pearls." Here the word *plumbum* would include tin. More explicit is the information given in the "Periplus of the Erythraean Sea," published in A.D. 60 by a Greek merchant of Berenice, in Egypt. This writer, whoever he was, gives a list of exports and imports, and describes the route taken by the traders in his day, from Egypt to India. He states* that tin and lead are carried to Barygaza, which is the modern Broach, near Bombay. Tin, lead, and copper, he says, are imported into Bacare (Porakad) and Nelcynda (Kottayam), both of which market-towns are on the Malabar coast, in the southern part of India. The metals were required for coins, which were made of lead, slightly alloyed with copper and tin. Whatever her resources in metals and however extensive her mines in later days, it appears that India at that time lacked metals, and therefore had to import them. The writer of the Periplus makes it clear that the traders took advantage of the south-west monsoon to cross the Indian Ocean; after leaving the Cape of Spices (Cape Guardafui) those bound for Baragaza, he says, "keep along the Arabian shore not more than three days

* Translation by Wilfred H. Schoff.

and for the rest of the time hold the same course straight out to sea from that region, with a favourable wind, quite away from land, and so sail outside past the aforesaid gulfs or bays, along the coast [as the coastal traders did]." He distinguishes clearly between the coastal commerce and the overseas trade between Egypt and India. Even if tin could have been brought overland from the Orient at this time, it is unlikely that it would have been carried concurrently by sea in the opposite direction. As George Smith remarks,* if the merchants of Malabar could have procured tin in the East, they would not have imported it from Egypt.

The first tin to reach the Mediterranean came overland probably. Ridgeway suggests† that it was brought to the Greeks from the head of the Adriatic, which was in communication with central Europe in very remote times. Scymnus of Chios speaks of tin that came from two islands at the head of the Adriatic. On these islands probably there were bronze foundries. Hungary, Bohemia, and Saxony had resources both in tin and copper, and these were uitilized in the making of bronze at an early period, although the long copper age of Hungary suggests an ignorance of the use of tin in making the alloy until a date later than its introduction at Babylon. During the so-called Early Bronze Age there was active trade between Jutland and Northern Bohemia, the one producing amber and the other tin. At Aunjetitz have been found many relics rich in tin, up to 25 per cent. The Elbe formed the link along which this barter of amber for tin was effected. Another European source of tin was Etruria, or Tuscany, which possessed the ores of both the metals required to make bronze. Populonium, near the Piombino of our day, was a smelting centre for tin, copper, and iron at successive epochs. It is possible that the Etruscan tin mines were the oldest in Europe, and that those of Germany were first

* "The Cassiterides," 1863.
† Sir William Ridgeway, "The Early Age of Greece," p. 609.

exploited by adventurers from Tuscany. All this must remain a matter for conjecture until more evidence is available. Probably never will the evidence be sufficiently explicit, because, among other reasons, the knowledge of the metals was so slight at the beginning of civilization that they were named confusedly. That is why the most ancient inscriptions are obscure.

In our endeavour to reach the source of the prehistoric tin we find our steps of meagre information trending repeatedly toward the region between the Persian Gulf, the Caucasus, and the Himalaya. The amount of tin available before 2000 B.C. was small, and the production of it does not call for a mining industry of ample proportions. Evidences of tin mining in south-western Asia are numerous and widely scattered. The word *κασσίτερος* belongs to an unknown early Indo-European language; it points to an Asiatic derivation. The trend of metallurgical knowledge at the dawn was westward. The races that migrated from Central Asia into Syria and into the Mediterranean basin carried with them the mandate of civilization: the use of the metals.